STATE OF COLORADO

John W. Hickenlooper, Governor
Larry Wolk, MD, MSPH
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
Located in Glendale, Colorado

www.colorado.gov/cdphe

Colorado Department
of Public Health
and Environment

February 28, 2015

Rick Moro
Pall Water Processing
25 Harbor Park Drive
Port Washington, NY 11050

Subject: Acceptance of the Pall Corporation Microza Membrane Modules an Alternative Filtration Technology to meet the *Colorado Primary Drinking Water Regulations* (CPDWR) requirements for *Giardia lamblia* and *Cryptosporidium* Removal

Dear Mr. Moro;

The Colorado Department of Public Health and Environment's Water Quality Control Division ("the Department") has received and reviewed the information for the Pall Corporation filtration systems utilizing the Microza modules in accordance with Section 11.8(2)(b)(ii) and 11.10(5)(j) of the *Colorado Primary Drinking Water Regulations* (Regulation 11), 5 CCR 1002-11. The Pall Microza module meets or exceeds the requirements of the *State of Colorado Design Criteria for Potable Water Systems* (DCPWS) Sections 1.11, 4.3.8 and Regulation 11. The technology is conditionally accepted for use as an Alternative Filtration Technology and granted the removal credit in Table 4.1, Section 4.3.8.2 of the DCPWS. The technical specifications and conditions of acceptance for the Pall Microza modules and Pall Aria skids are outlined in Tables 1 and 2 as well as Section 4.3.8 of the DCPWS.

This acceptance supersedes the previous acceptance of the Microza modules and associated filtration skids dated May 23, 2014.

This acceptance addresses the following items:

- Pall Corporation Microza microfiltration modules
- Pall Aria filtration skids (AP 1-8)

This acceptance applies only to the Pall Microza modules and does not constitute construction approval for installation at any public water system. Each individual submittal to the Department must demonstrate conformance with Section 4.3.8 of the DCPWS for each installation of the filters and filtration skids. **Review and approval for the design of any public water system proposing to use this technology will be handled on a case-by-case basis by the Department as required by Section 11.4 of Regulation 11.**

As part of this review, the Department has evaluated the following documents:

- Environmental Technology Verification Report – Pall Corporation Microza Module, Feb. 2000, Mar 2002, Sept 2005

- Membrane filtration review document (Jan 2010) – Binder provided to the Division by Pall corporation
    - Supplemental information to the review documents (Sections 1-23) including process schematics for the Aria skids
- http://www.nsf.org – Pall corporation materials certification for membrane components

Any addenda that will modify the modules must be submitted to the Department for review and acceptance prior to use in Colorado by a regulated public water system. This requirement includes any changes made to the Pall Microza materials of construction and associated interfaces with process piping. The Department will review any additional third party verification reports and issue a revised acceptance letter if appropriate.

Table 1: Microza Technical Specifications and Conditions of Acceptance

Filter Manufacturer	**Pall Corporation**
Filter Model	**Microza**
Maximum Flux (gfd -gallons per sq. ft. per day) @ 20 °C	120
Maximum Flux (gfd) @ 1 °C	69
Max Transmembrane Pressure lbs per square inch differential (psid)	43.5
Alarm Transmembrane Pressure (psid)	43.5 (35 triggers Clean in Place – CIP)
Maximum Inlet Pressure – lbs per square inch gauge (psig)	43.5 psig
Minimum direct integrity test pressure (starting pressure)	17.5 psig
Direct integrity testing failure criteria	>0.1 psig per 5 minute (interval) decay – per Pall protocol
Prefiltration	Not specified
Additional Operations and Maintenance Criteria	
1. If a filter fails an integrity test, the filter must be removed from service immediately and replaced with a functional filter or repaired prior to being returned to operation. 2. The public water system must keep records of the following operational parameters (available for Department review): a. Integrity test date, results (pass or fail), and initials of person performing the test b. Clean in place (CIP) dates with clean water permeability and integrity test result. c. Filter maintenance and fiber repair results d. Filter replacement date and reason for replacement. 3. Public water systems must maintain an operation and maintenance manual for the micro/ultratfiltration system. All integrity tests and CIP procedures must follow manufacturer prescribed procedures.	

Table 2: Pre-Accepted Aria Skids Conditions of Acceptance:

Skid Type	**Aria**						
Skid Model Number	**AP1**	**AP2**	**AP3**	**AP4**	**AP6**	**AP6x**	**AP8**
Maximum Daily Production (gallons) Based on max flux (@1°C)– See Table 1	28	49	174	500	694	867	1388
Bleed Valve for Block and Bleed Assembly	Valve HV4	AP2 to Tank 2	V29 bleed to drain	V29 bleed to drain	V6 to Tank 2	V6 to Tank 2	V29 bleed to drain
Cross connection control (DCPWS 4.3.8.8(b)(vii))	Verified. **For AP1 – standard block and bleed assembly – a leak in the valve signifies a cross connection and valves must be replaced or repaired.** **For other skids – bleed valve feeds Tank 2 – which is monitored with a level sensor. If level changes – leak is occurring and valves must be replaced or repaired.** **All skids MUST have cross connection control options installed.**						
Individual Skid Effluent Turbidity (DCPWS 4.3.8.10(a)and (d))	Verified on P&ID.						
Flow Control (DCPWS 4.3.8.10 (c) and (e))	Verfied on P&ID.						

Please be aware that any point source discharges of water from treatment facilities are potentially subject to a discharge permit under Colorado's State Discharge Permit System. Any point source discharges to state waters without a permit are subject to civil or criminal enforcement action.

Please direct any further correspondence regarding this acceptance to:

Tyson Ingels, P.E.
Colorado Department of Public Health and Environment
Water Quality Control Division
4300 Cherry Creek Drive South
Denver, CO 80246

If you have any questions or comments, please call Tyson Ingels at 303-692-3002.

Sincerely,

Tyson Ingels, P.E.
Lead Drinking Water Engineer
Engineering Section - Water Quality Control Division